

CLAIMS

1. A coating composition for siliconizing,
comprising:
 - 5 a Fe-Si-based composite compound sintered powder
having a grain size of -325 mesh and containing 20 - 70 %
silicon by weight; and
a colloidal silica solution containing 15 - 30 part by
weight of silica solid matter with respect to 100 part by
10 weight of the sintered powder.
2. The coating composition according to claim 1,
wherein the Fe-Si-based composite compound sintered powder
has a surface oxide layer formed on a surface thereof and
15 containing oxygen less than 2.0%.
3. The coating composition according to claim 1,
further comprising at least one selected from the group
consisting of fine SiO₂ powder, alumina powder and alumina
20 sol by 0.2 - 3.5 part by weight with respect to 100 part by
weight of the Fe-Si-based composite compound sintered
powder.
4. The coating composition according to claim 1,
25 wherein the Fe-Si-based composite compound sintered

powder substantially comprises FeSi_2 , FeSi , Fe_5Si_3 , or Fe_3Si , and comprises the sintered powder of $\text{FeSi}_2+\text{FeSi}$ in excess of 90 wt% with respect to the weight of the Fe-Si-based sintered powder.

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5. A method for manufacturing a high silicon electrical steel sheet, comprising the steps of:

coating and drying the coating composition as recited in any of claims 1 to 4 on a surface of a steel sheet
10 containing 2.0 - 3.3 wt% Si; and

diffusion annealing the dried steel sheet in a nitrogen gas atmosphere containing 20% or more hydrogen at a temperature range of 1000 - 1200 °C.

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6. The method according to claim 5, wherein the drying step is performed at a temperature of 200 - 700 °C.

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7. The method according to claim 5, wherein the diffusion annealing step is performed at a temperature of 1050 - 1200 °C.

8. In a method for manufacturing a high silicon grain-oriented electrical steel sheet, comprising the steps of: reheating and hot-rolling a steel slab to produce a hot
25 rolled steel sheet; annealing a hot rolled sheet and cold

rolling the steel sheet to adjust a thickness of the steel sheet; decarburization annealing the steel sheet; and secondary recrystallization annealing the steel sheet,

the improved method further comprising the step of:

5 pickling the surface of the grain-oriented electrical steel sheet where the secondary recrystallization is completed to remove a surface oxide layer;

coating and drying the coating composition as recited in any of claims 1 to 4 on the surface of the pickled
10 electrical steel sheet; and

diffusion annealing the dried electrical steel sheet in a nitrogen gas atmosphere containing 20% or more hydrogen at a temperature range of 1000 - 1200 °C.

15 9. The method according to claim 8, wherein the steel sheet to be coated with the coating composition contains 2.9 - 3.3wt% Si with respect to the weight of the steel sheet.

20 10. The method according to claim 8, wherein the steel sheet coated with the coating composition is dried at a temperature of 200 - 700 °C.

11. The method according to claim 8, wherein the
25 steel sheet coated with the coating is diffusion annealed

at a temperature of 1050 - 1200 °C.

12. The method according to claim 8, wherein the coating composition is coated on the surface of the steel sheet so as to satisfy the following formulas 1 and 2:

$Y - 5 \leq \text{coated amount} \leq Y + 5$ ----- formula 1, and

$Y(\text{g/m}^2) = 7650t(x1 - x2)/(A - 14.4)$ --- formula 2,

where 't' is a thickness of matrix material, A is a Si content (%) in the Fe-Si-based sintered powder, x1 is a target Si content (%) of matrix material, and x2 is an initial Si content of matrix material.

13. In a method for manufacturing a high silicon non-oriented electrical steel sheet, comprising the steps of: reheating and hot-rolling a steel slab to produce a hot-rolled steel sheet; annealing the hot-rolled steel sheet and cold rolling an annealed steel sheet to adjust a thickness of the steel sheet; recrystallization annealing the cold-rolled steel sheet,

the improved method further comprising the step of:

coating and drying the coating composition as recited in any of claims 1 to 4 on the surface of the cold rolled steel sheet; and

diffusion annealing the dried electrical steel sheet in a nitrogen gas atmosphere containing 20% or more

hydrogen at a temperature range of 1000 - 1200 °C.

14. The method according to claim 13, wherein the steel sheet to be coated with the coating composition
5 contains 2.9 - 3.3 wt% Si.

15. The method according to claim 13, wherein the steel sheet coated with the coating composition is dried at a temperature of 200 - 700 °C..

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16. The method according to claim 13, wherein the steel sheet coated with the coating composition is homogenized at a temperature of 1050 - 1200 °C.

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17. The method according to claim 13, wherein prior to coating the coating composition, the cold rolled steel sheet is intermediate-annealed such that a total oxygen content in a surface oxide layer of the steel sheet is 210 - 420 ppm.

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18. The method according to claim 17, wherein the cold rolled steel sheet is intermediate-annealed at a temperature range of 950 - 1100 °C.

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19. The method according to claim 17, wherein the

cold rolled steel sheet is intermediate-annealed in a nitrogen atmosphere containing 50 % or more hydrogen and a moisture atmosphere with a dew point ($\text{PH}_2\text{O}/\text{PH}_2$): 0.06 - 0.30.

- 5 20. The method according to claim 13, wherein the coating composition is coated on the surface of the steel sheet so as to satisfy the following formulas 1 and 2:

$Y - 5 \leq \text{coated amount} \leq Y + 5$ ----- formula 1, and

$Y(\text{g/m}^2) = 7650t(x1 - x2)/(A - 14.4)$ --- formula 2,

- 10 where 't' is a thickness of matrix material, A is a Si content (%) in the Fe-Si-based sintered powder, x1 is a target Si content (%) of matrix material, and x2 is an initial Si content of matrix material.